

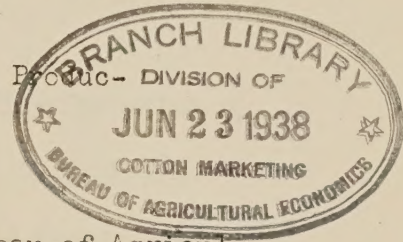
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July 29, 1938.)

June

The Relation of Mechanical Harvesting to the Produc-
tion of High Grade Cotton



Address by Charles A. Bennett of the Bureau of Agricultural Engineering, U.S. Department of Agriculture, before the 32nd Annual Meeting of the American Society of Agricultural Engineers, 12:30 p.m. P.S.T., June 29, 1938, at Asilomar, Pacific Grove, Calif.

The development of mechanical cotton pickers has not yet reached a stage where it is easy to remove the trash of conjecture and wishful thinking from the lint of fact. At the U.S. Department of Agriculture Cotton Ginning Laboratories at Stoneville, Miss., we have been giving some attention to these new machines and I am going to say a few things about what we have observed and what we have learned from others in the Department. I wish especially to acknowledge the help of F.L. Gerdes, A.J. Johnson, W.J. Martin and Hughes Butterworth of the Bureau of Agricultural Economics and W.R. Humphries of the Bureau of Agricultural Engineering.

Our agricultural engineering contacts with mechanical cotton harvesters, in projects of machinery for processing farm products, began in 1927 during the development of processes and equipment for drying seed cotton and we have since continued to be in rather close touch with tests and demonstrations of these machines.

From these somewhat intimate observations, we are forced to the conclusion that while appreciable progress has been made, the problems of mechanical harvesting have not yet been worked out to the stage where we may expect to obtain high grade cottons by existing mechanical means of harvesting and ginning.

Various objectives of mechanical harvesting have become clear, but thus far they appear to be to pick cotton "almost as good as" instead of "better than" by hand picking which is our criterion today. Objectives include the following:

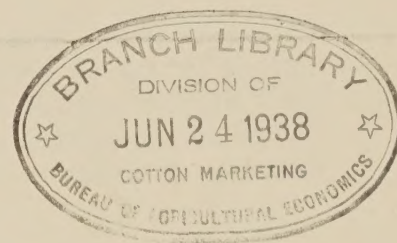
1. To entirely replace manual harvesting by mechanical methods; or
2. To supplement manual labor continuously during the cotton gathering season; or
3. To clean up all late season portions of open cottons remaining after defoliation of the cotton plants.

June 23, 1938.

CORRECTION

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In the talk by Charles A. Bennett on "The Relation of Mechanical Harvesting to the Production of High Grade Cotton" mailed you yesterday, the release date should be June 29, 1938 instead of July 29, 1938.



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High grade cottons can only be obtained from freshly opened portions of the crop, and these must have those characteristics in moisture and foreign matter contents which will permit ginning machinery to preserve the inherent good qualities of the cotton. The universal grade standards of classification for white cotton run from high to low grades as follows: 1, Middling fair, (Descriptive:) 2, Strict good middling; 3, Good middling, 4, Strict middling, 5, Middling; 6, Strict low middling; 7, Low middling; 8, Strict good ordinary; 9, Good ordinary.

The processes of ginning are the bottle-neck through which all raw cottons must pass in preparation for use in spun goods, yarns and thread. Unfortunately, thousands of ginning tests at the U.S. Cotton Ginning Laboratory have proved that existing conditioning, extracting, cleaning and ginning machinery cannot fully restore to originally high-grade cottons those qualities that have been impaired by rough harvesting or improper handling.

Under such conditions it appears that the mechanical harvesting objectives must therefore be modified for an indefinite time so as to focus upon the quantity production of medium to low grades of cotton rather than upon those higher grades above middling which often are difficult to obtain even with manual labor unless the cotton is hand picked carefully, cleanly and promptly after opening.

Within the confines of this paper it is possible only to touch briefly upon the principal kinds of mechanical harvesters that have been or are now in use. Sleds having comb-like bottoms, used occasionally in the past with large crops but obsolete now, were the crudest form of harvesters; strippers, with or without attachments mark an improvement over sleds; and mechanical pickers, which are the oldest inventions of the group, with or without attachments, harvest cotton in better condition than strippers do.

Strippers equipped with extracting and cleaning attachments, have, in many instances, given good results, so far as capacity is concerned, but the cottons have never ginned out as high quality cottons. Strippers thus fulfill in part objectives 1 and 3. In tests at the U.S. Cotton Ginning Laboratory on Texas stripped cottons, the highest grade we have been able to attain has been low middling, or No. 7 from the top in the official standards of grade. Spindle type mechanical pickers have, in very few instances, produced pickings that ginned out samples of strict low middling grade.

Regional conditions affect variously many elements in both harvesting and ginning. The arid regions of western Oklahoma and Texas have very short cottons and a scarcity of labor. Furthermore, the plant growth is usually small and uniform; the bolls maturing and open within a comparatively short period; and the plants become defoliated relatively early and completely. Ginning establishments, representing investments of \$40,000 or more per gin battery of five stands, can handle such cottons from strippers with fairly good results because the cottons are not high quality to begin with. But, in such regions, the lower capacity spindle-type machine pickers can hardly compete with strippers because of the relatively low yields.

In the south central areas of the United States where long staple, high quality cottons are grown, the strippers are not applicable, and the harvesting difficulties are much greater. Cotton plant growth is more profuse, larger, leafier and more moist. Likewise the ginning problems of producing high grade cottons are actually more complex in addition to machinery set-ups being less complicated than in the southwestern regions. From these aspects, one may glimpse the task that lies before spindle machine pickers in endeavoring to obtain high grade cotton.

The Bureaus of Agricultural Economics and Agricultural Engineering in a mimeographed preliminary report 1/ now in the process of publication state that "both types (stripper and spindle picker machines) gather an abundance of plant foliage along with the seed cotton. The bulk of the foreign matter in cotton harvested by the strippers is burs and stems, while in cotton harvested by the mechanical picker there is a preponderance of leaf trash, especially when the plant foliage is green and intact. In designing present day cleaning equipment, manufacturers have directed efforts more toward the removal of burs and fine leaf trash, such as that present in snapped cotton, than toward the removal of large particles of green leaf that contaminate the quality of cotton harvested by the spindle or finger type of mechanical picker."

In an effort to speed up cotton harvesting, mechanical methods have been sought for and many different kinds developed. The main types of mechanical harvesters tested in recent years are of the stripper and the picker types. The stripper device is designed in such a way that the burs and much foliage are incidentally removed along with the cotton by stripping the plants between stationary slots or revolving rolls. The picker type machine is designed to pick the open cotton from the bolls by means of spindles or fingers. These harvesters often leave an appreciable amount of cotton on the ground, and some cotton on the stalks.

Machine pickers may have their suction picking heads operated manually or they may be strictly mechanical in all respects

They have been tried out (last year) on both early and late season cottons of high potential values and have gathered from 4.7 to 7.1 pounds of foreign matter per 100 pounds of seed cotton as compared to 1.8 and 6.6 by hand picking for the corresponding cottons.

Mechanical harvesters such as strippers and spindle pickers have thus far produced seed cottons in which leaf and other particles of foreign matter have become entangled in such a manner as to be difficult of removal by cleaning equipment in the gins. The large leaf particles are too large to be screened out, and excessive handling through cleaning and drying equipment may shatter them with attendant lowering of grade.

1/ Cotton Harvesting and Handling, by F.L. Gerdes, W.J. Martin and C.A. Bennett.

There is a striking difference in appearance between early cottons picked by spindle pickers and those which have been carefully hand picked. The machine pickings have a more matted, entangled and wadded appearance, mottled with quantities of green leaf throughout the locks. Here and there are green juicy stains upon the fiber and some portions of bark, stems and long grasses. On the other hand, the manual, early harvested clean cottons are outstanding for the natural color characteristics of the fiber, for individuality of locks, and for other general aspects of good quality.

At the gins during 1937 it was possible to remove only an average of 53 percent of a total of 5.9 percent of foreign matter (mostly leaf trash) from the mechanically picked as compared to 66 percent from a total of 4.2 percent of foreign matter (mostly burs) in the hand picked cottons.

Percentages of cotton picked by spindle-type mechanical pickers have approached 90 percent of the available open cotton, while the amount knocked on the ground has not been excessive - ranging from 3 to 8 percent as the season advanced.

When this seed cotton reaches the ginning processes, the moisture and foreign matter contents present many problems.

The results of our ginning experiences with these cottons have not been encouraging, except in isolated cases. On the average the spindle pickers have produced lint from one to two or more grades lower than that from corresponding hand pickings.

How near the more recent developments in mechanical pickers may approach the principal objectives is of course problematical.

It may be asked at this point what the spinning mills require, and how mechanically picked cotton can be eventually handled to turn out a good and usable product? As we have already pointed out, the present day ginning processes are inadequate to cope profitably with mechanically picked long staple cottons, although they are doing fairly well with the snapped and stripped short cottons and "bollies" of the southwest.

The Bureau of Agricultural Economics reported ^{2/} that spinning tests of cotton harvested with a new mechanical cotton picker which was extensively publicized last year have revealed that even with the use of full batteries of gin cleaners and extractors the machine picked cotton was of appreciably lower grade and yielded much more manufacturing waste than hand-picked cotton from the same field and similarly treated. Cotton harvested early in the season by machine was more wasteful, because of the green leaf picked with it, than cotton gathered later when the leaves had dried.

It may therefore be said, (1) that we have not yet reached the goal of producing mechanically-harvested, high-grade cottons with our present

^{2/} Report of the Chief of the Bureau of Agricultural Economics, 1937, p.13.

day pickers and gins, despite the increasing number of encouraging developments that have occurred from time to time; (2) that the ginning industry has yet to find a satisfactory means for overcoming the difficulties presented in the ginning of mechanically picked cottons of existing characteristics; and (3) that the cotton breeders must develop new strains of cotton varieties which by special characteristics will especially make for better "pickability" on the part of mechanical pickers. The problem is therefore threefold and falls within the fields of activity of the cotton breeder, the manufacturer of the harvesting machinery, and the cotton ginner.

Be that as it may, so much has already been accomplished by the developers of mechanical cotton harvesters, by the manufacturers of ginning machinery and by the cotton plant breeders that we look to their continued and combined efforts for additional improvements.

